

Art Unit: 2800

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41. (new) A method of forming a silicon dioxide layer, comprising:
forming a high density plasma proximate a substrate;
flowing gases into the plasma, at least some of the gases forming
silicon dioxide;
depositing the silicon dioxide formed from the gases over the substrate;
and
not cooling the substrate with a coolant while depositing the silicon
dioxide.

43. (new) The method of claim 41 wherein material from the silicon
dioxide layer is comprised by a shallow trench isolation region.

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44. (new) A method of forming a silicon dioxide layer, comprising:
forming a high density plasma having a density of at least 10^{10}
ions/cm³ proximate a substrate;
flowing gases into the plasma, at least some of the gases forming
silicon dioxide;
depositing the silicon dioxide formed from the gases over the substrate
at a deposition rate; and
while depositing the silicon dioxide, maintaining a temperature of the
substrate at greater than or equal to about 500° C and etching the deposited
silicon dioxide with the plasma at an etch rate, a ratio of the deposition rate
to the etch rate being at least about 6:1.
45. (new) The method of claim 44 wherein the gases comprise SiH₄
and oxygen.
46. (new) The method of claim 44 wherein the gases comprise SiH₄,
oxygen, and argon.
47. (new) The method of claim 44 further comprising:
forming openings in the substrate; and
depositing the silicon dioxide within the openings.
48. (new) The method of claim 47 further comprising preventing void
formation in the silicon dioxide within the openings.

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49. (new) The method of claim 47 wherein material from the silicon dioxide layer is comprised by a shallow trench isolation region.

50. (new) A method of forming silicon dioxide comprising:
forming an opening extending into a substrate;
thermally oxidizing the substrate to form a first layer of silicon dioxide within the opening; and
forming a second layer of silicon dioxide on and in contact with the first layer within the opening, the forming of the second layer of silicon dioxide comprising:

forming a high density plasma proximate the substrate;
flowing gases into the plasma, at least some of the gases forming silicon dioxide;

maintaining the substrate at a temperature of at least about 500° C; and

while maintaining the substrate at said temperature, depositing the silicon dioxide formed from the gases within the opening.

51. (new) The method of claim 50 further comprising preventing void formation in the silicon dioxide within the openings.

52. (new) The method of claim 50 wherein material from the first and second layers is comprised by a shallow trench isolation region.

53. (new) A method of forming a shallow trench isolation region comprising:

forming an opening extending into a substrate;

forming a first layer of silicon dioxide within the opening; and

forming a second layer of silicon dioxide over the first layer within the opening, material from the first and second layers within the opening being comprised by the shallow trench isolation region and the forming of the second layer of silicon dioxide comprising:

forming a high density plasma proximate the substrate;

flowing gases into the plasma, at least some of the gases forming silicon dioxide;

maintaining the substrate at a temperature of at least about 500°

C; and

while maintaining the substrate at said temperature, depositing the silicon dioxide formed from the gases within the opening.

54. (new) The method of claim 53 wherein the opening extends less than or equal to about 1 micron into the substrate.

55. (new) The method of claim 53 wherein the opening has an aspect ratio of from about 2.5 to about 1.

56. (new) The method of claim 53 wherein forming the first layer comprises heating the substrate in the presence of oxygen.

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57. (new) The method of claim 53 wherein the second layer contacts the first layer.
58. (new) The method of claim 53 wherein the second layer fills the opening.
59. (new) The method of claim 53 wherein the second layer overfills the opening.
60. (new) The method of claim 53 wherein the shallow trench isolation region consists of material from the first and second layers.
61. (new) The method of claim 53 wherein the gases comprise SiH_4 and oxygen.
62. (new) The method of claim 53 wherein the maintaining the temperature of the substrate comprises heating the substrate with the plasma.
63. (new) The method of claim 53 wherein the temperature comprises greater than 700°C to about 1000°C .
64. (new) The method of claim 53 wherein the depositing the silicon dioxide occurs without cooling the substrate with a coolant while depositing the silicon dioxide.

65. (new) The method of claim 53 wherein the silicon dioxide is deposited at a deposition rate, and further comprising etching the deposited silicon dioxide with the plasma at an etch rate, a ratio of the deposition rate to the etch rate being at least about 6:1.

66. (new) The method of claim 65 wherein the ratio of the deposition rate to the etch rate is at least about 9:1.

67. (new) The method of claim 53 further comprising preventing void formation in the second layer within the opening.

68. (new) A method of forming a shallow trench isolation region comprising:

forming an opening extending into a substrate that comprises steps at peripheries of the opening;

thermally oxidizing the substrate to form a first layer of silicon dioxide within the opening; and

forming a second layer of silicon dioxide within the opening to fill the opening, the shallow trench isolation region consisting of material from the first and second layers within the opening and the forming of the second layer of silicon dioxide comprising:

forming a high density plasma proximate the substrate;

flowing gases into the plasma, at least some of the gases forming silicon dioxide;

maintaining the substrate at a temperature of at least about 500° C; and

while maintaining the substrate at said temperature, depositing the silicon dioxide formed from the gases within the opening, the depositing achieving better step coverage than would otherwise occur at a lower temperature less than or equal to 300° C.

69. (new) The method of claim 68 wherein the second layer overfills the opening.

70. (new) The method of claim 68 wherein the temperature comprises greater than 700° C to about 1000° C.

71. (new) The method of claim 68 wherein the depositing the silicon dioxide occurs without cooling the substrate with a coolant while depositing the silicon dioxide.

72. (new) The method of claim 68 wherein the silicon dioxide is deposited at a deposition rate, and further comprising etching the deposited silicon dioxide with the plasma at an etch rate, a ratio of the deposition rate to the etch rate being at least about 6:1.

73. (new) The method of claim 72 wherein the ratio of the deposition rate to the etch rate is at least about 9:1.

74. (new) The method of claim 68 further comprising preventing void formation in the second layer within the opening.

75. (new) A method of forming a shallow trench isolation region, comprising:

- forming a pad oxide layer over a semiconductive substrate;**
- forming a silicon nitride layer over the pad oxide layer;**
- forming an opening extending through the silicon nitride layer, through the pad oxide layer, and into the substrate;**
- forming a first layer of silicon dioxide within the opening; and**
- forming a second layer of silicon dioxide over the first layer within the opening, material from the first and second layers within the opening being comprised by the shallow trench isolation region and the forming of the second layer of silicon dioxide comprising:**
 - forming a high density plasma proximate the substrate;**
 - flowing gases into the plasma, at least some of the gases forming silicon dioxide;**
 - maintaining the substrate at a temperature of at least about 500° C; and**
 - while maintaining the substrate at said temperature, depositing the silicon dioxide formed from the gases within the opening.**

76. (new) The method of claim 75 wherein forming the first layer comprises heating the substrate in the presence of oxygen.

77. (new) The method of claim 75 wherein the second layer contacts the first layer.

78. (new) The method of claim 75 wherein the second layer fills the opening to an elevational level of the semiconductive substrate.

79. (new) The method of claim 75 wherein the second layer fills the opening to an elevational level of the silicon nitride layer.

80. (new) The method of claim 75 wherein the shallow trench isolation region consists of material from the first and second layers.

81. (new) The method of claim 75 wherein the maintaining the temperature of the substrate comprises heating the substrate with the plasma.

82. (new) The method of claim 75 wherein the temperature comprises greater than 700° C to about 1000° C.

83. (new) The method of claim 75 wherein the depositing the silicon dioxide occurs without cooling the substrate with a coolant while depositing the silicon dioxide.

84. (new) The method of claim 75 wherein the silicon dioxide is deposited at a deposition rate, and further comprising etching the deposited silicon dioxide with the plasma at an etch rate, a ratio of the deposition rate to the etch rate being at least about 6:1.

85. (new) The method of claim 84 wherein the ratio of the deposition rate to the etch rate is at least about 9:1.

86. (new) The method of claim 75 further comprising preventing void formation in the second layer within the opening.